Big Sky

Clearwater

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Injecting sludge

A close look on Page 1

Sludge injection working at Kalispell

Thanks to a monster only STP operators could love

By Will Aikin
Water Quality Bureau's
Kalispell Branch

WHEN IT'S SPRINGTIME in the Flathead, the first crop to ripen in recent years has been the sludge, not the cherries. "Make it go away!" chorused the local citizens, especially those straight downwind from the latest bumper crop. Sensing a clear mandate from the noses of the electorate, city fathers leaped into action, fingered the culprit (an overmatched Purifax unit at the Kalispell sewage treatment plant), jammed themselves into a telephone booth and emerged heroically wearing a big A on their chests.

Pure fantasy you might say, and that it is; however, if you were to sprinkle this scenario with threats, insults, legal briefs, double-speak and fancy engineering foot-work, that is what a bystander might have observed last year if he (a) had a nose that knew a rice paddy when it smelled it, (b) got all of his information from the local newspaper, and (c) encountered our local monster, the BIG A, thundering down the road, all 19,000 pounds of him carrying 2,200 gallons of sludge to be deposited where it can never be smelled again. In reality, the people were viewing an "Interim Sludge Management Program" that really worked.

Sludge injection is the real hero of this piece, and the real-life location is the sewage treatment plant at Kalispell, Montana, close to a large convention center, an airport and a large proportion of the valley's better motel-restaurant accommodations. The not-so-refreshing morning and evening breeze blew in trouble with a capital T until the city leased a large self-propelled sludge injection machine from Richel Manufacturing of Salina, Kansas. With a ludicrous name--"Big A"--stenciled clearly on its body, this mammoth vehicle began

MSAWWA

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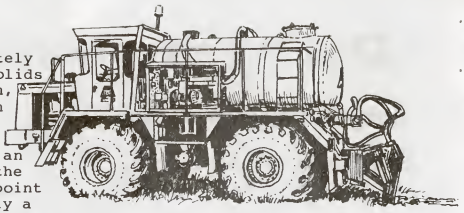
injecting soil with approximately 11,000 gallons of 4-percent-solids sludge every working day--rain, shine or snowfall (except when fields were too soft).



The Big A turned out to be an honest horse that has turned the local problems around to the point that loud grumbling is now only a faint mumbling. And it is doing all of this for a lease rate of only $1700 per month. Labor, O & M, land and administrative overhead add to the total; however, this amount compares favorably to the money spent only on the chlorine which was used in the preceding process. On top of that, the earlier Purifax process added injury to insult by pumping significant amounts of chlorine into a sensitive environment and, at best, produced a smelly residue "cake" which de-watered poorly and still needed to be disposed of.

THE SLUDGE-INJECTION system does have its critics: a fellow across the road from the injection site, a skeptical local-agency hydrologist and, above all else, the EPA (it must be emphasized that the process is handling raw sludge). However, the scheme has been fit into a local long-range sludge management plan, groundwater is being monitored, the operation is making do on its budget, the injection site is approved for the purpose and, most important, experience is being gained.

The machine has been in use for 16 months now, and it has proven to be reasonably reliable. Sure, the Cummings 555 Diesel uses about 3 gallons per hour and the operator spends quite a bit of time torquing bolts to keep the framing tight (early on, the fuel-tank mounting fell off), but an average 1/2 hour of maintenance per 8-hour shift does keep the unit ready. Surprisingly, the hydraulic pressure vacuum system--that both fills the truck and discharges the contents--has caused no significant down time. A spring-loading mechanism which controls the injector mounting bar also has to be forced manually from time to time, so the machine is not annoyance-proof; but the Big A has been working, or is ready to work, winter and summer, during its brief stay in Kalispell.

Keeping rubber on the machine is a somewhat different story. Tires are 67x34, ten-ply, and misuse can make a difference in longevity. Richel Mfg. recommends 25 pounds inflation pressure because they view this as an off-road vehicle, which is what it often is; while Goodyear, the tire people, cite 40 pounds as a hard-surface working pressure. Since the two available disposal sites are opposite types--the most popular one a mile away on an asphalt roadway, and the other close in, in an adjacent field with total off-highway use--it is possible to make pressure errors. Two tires, at $1700 each, had to be replaced.

The Kalispell sewage-treatment plant--which is supplying the sludge for injection--is a comparatively recent "activated biofilter" which has continued to make use of pre-existing clarification basins. The old digestor, which was part of the earlier primary plant, is the reservoir from which the truck is loaded. This has proven to be both a blessing, because it was there, and a problem because the hydraulic head in the digestor determines how fast the trucks can be loaded. Loading time is an important part of determining how many trips can be made in an eight-hour shift. At the

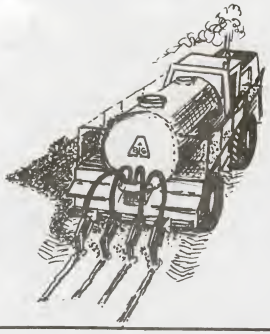
moment, fill time averages 10 minutes. It would be advantageous to have the digestor further up the slope for more head, and then equip it with 12-inch supply lines to the receiving truck. Right now the existing 6-inch supply line, which necks down to 4 inches, does slow things up if the digestor is only one-sixth to one-tenth full.

THE DRIVER, Louis Jenkins, is a very important part of the Big A. The four injectors have been set to plow at about 8 inches deep when sludge discharging occurs. But as the truck empties, the unit lightens and the frame rises, bringing the injectors with it so that deposition nears the surface. Jenkins makes adjustments in mid-traverse to maintain proper depth. Humps, dips and ridges must be approached cautiously or else the lurching and yawing injector points will clear the ground and spew sludge across the surface. The truck also must be moving properly before the injector pump is engaged or an unattractive pool of sludge will be left at the point of departure. The 40-acre site which the city of Kalispell is injecting--a mile from the STP--is a pasture. People in the program wish it were plowed land that could be harrowed from week to week to correct minor spills that inevitably occur. In the Big A, the injection volume is geared to engine RPM. Jenkins would like to have a device to control injection volume from the cab so that he wouldn't have to fire-up and run through the gears hoping that he has guessed right, not knowing what has happened behind him until he climbs out and looks.

Injection at the sites has not caused any visible adverse impacts. Pic Olson, the man who is ramrodding the STP operation, has solemnly observed that "maybe the grass is getting greener." Focusing on the most heavily used pasture site (as opposed to the adjacent airport site), officials figure to use about one acre a day, four times a year. At 5 1/2 loads per day, average, that means about 48,000 gallons of sludge per acre per year, which is more than the review authorities really would wish for, but the pasture does appear to be assimilating this volume for the time being. The adjacent airport site is getting a somewhat lighter loading. Soil testing will probably be necessary somewhere down the road toward a final management plan, but right now the situation seems to be within safe limitations. Fortunately, these soils are highly alkaline, a fact which helps to limit side effects. Except for the groove tracings and dried splatters, the place could still be mistaken for a pasture.

Winter operations are different but no more difficult, hopefully not just because the 1980-81 winter was a mild one. Three-foot-deep trenches (three linear miles worth) were prepared in the fall and, as the winter unfolded, they were filled to about a two-foot depth. Freezing is an efficient natural separator of liquids and solids. When the liquid soaked into the soil, the contents of the trench were reduced to a soggy matt by the time spring demanded a back-filling and leveling operation.

LIKE THE OLD ROAMING ranch hand that hit town for the winter and earned his keep doing the nasty odd jobs, the Big A is now getting ready to move along--it's been sold to another community. Kalispell is back in the market for a new beast. With its experience behind it, Kalispell thinks a bigger unit will be an even better answer to its problems. Specifications have been written and an imposing 3500-gallon unit (60 percent larger) is the present target. The assumption is that it would do the job faster and certainly just as well. With it a new problem will be born: where do you stable a 3500 gallon sludge truck that normally



only gets hosed off about once a week?

Considering the magnitude of the original odor problems in Kalispell, the sludge injection process is truly cost-beneficial. However, as with all good things there is a hidden flaw. RAW sludge does not fit into some of the federal criteria as a safe product for that kind of land application and on that narrow thread is now hanging the future of the present program.

But then, that's going to be a different story; and it is, as yet, unwritten.

School and exams set for September

THE 48th ANNUAL SCHOOL and Conference for Water and Wastewater Operators and Managers will be held Sept. 14-17 in Johnson Hall at Montana State University in Bozeman. Operator certification exams will be given on Friday, Sept. 18, in the large lecture room of Johnson Hall (the Student Union, where the conference and exams are usually held, is being remodeled).

The exams will be from 8 a.m. to noon, and attendance at the school is not required in order for a person to take them. However, those taking the test but not attending the school must notify the Montana Board of Certification for Water and Wastewater Operators, Room A206, Cogswell Building, Helena, 59620 and submit applications and fees before Sept. 4. Holders of temporary certificates for Class 1, 2 and 3 operators are required to take the exam unless a valid reson is submitted to the board.

Dr. Ross E. McKinney will be the featured speaker at this year's school. Dr. McKinney is the N.T. Veatch Distinguished Professor of Civil Engineering at the University of Kansas and has been active in the water and wastewater fields for 30 years. He is the author of the textbook Microbiology For Sanitary Engineers, many technical research reports, and more than 160 articles in professional journals. Several operators of water and wastewater plants also will be giving presentations this year.

The Sessions for Operator Study (SOS) will provide practice math sets and other material that will assist operators in preparing for the certification exams to be given on Friday.

CONFERENCE SCHEDULE

Monday, September 14

Morning - Joint Session
7:30 Registration
8:30 Welcome

8:45 Response & School Objective
9:00 Operator Certification - Why, Who, How?
9:30 Break
10:00 Public Relations & Communications
11:45 Lunch

Afternoon Session 1 - Water Systems
1:00 An Overview of Water Treatment Processes
2:15 Break
2:30 Water Treatment
4:00 Session for Operator Study (SOS)

Afternoon Session 2 - Wastewater Systems
1:00 An Overview of Wastewater Treatment Processes
2:15 Break
2:30 Wastewater Treatment (cont.)
4:00 Session for Operator Study (SOS)

Tuesday, September 15

Morning - Joint Session
8:00 "What is the Montana Rural Water Association?"
8:15 Presentation by Ross E. McKinney
9:30 Break
10:00 Presentation, cont.
11:45 Lunch

Afternoon Session - Water Systems
1:00 Maintaining a Water Distribution System
3:00 Break
3:15 Membrane Filter Procedure for Total Coliform Determination
-or-
Session for Operator Study (SOS)
4:00 SOS, cont.

Afternoon Session - Wastewater Systems
1:00 Maintaining a Wastewater Collection System
3:00 Break
3:15 Membrane Filter Procedure for Fecal Coliform Determination
-or-
Session for Operator Study (SOS)
4:00 SOS, cont.

Wednesday, September 16

Morning - Joint Session
8:00 Preventative Maintenance: Development & Implementation
10:00 Break
10:30 Pump Maintenance
11:45 Lunch

Afternoon - Joint Session
1:00 "A View from the Outside"--An Engineering Viewpoint on the Operator's Role in Treatment Plant Design
2:30 Break

Afternoon Session 1 - Large Water Systems
2:45 Using Polyelectrolytes in Water Treatment
4:30 SOS

Afternoon Session 2 - Small Water Systems
2:45 Wells, Construction, Maintenance, & Pump Operation
4:30 SOS

Afternoon Session 3 - Wastewater Systems
2:45 Microbiology of Wastewater
4:30 SOS

Thursday, September 17

Morning Session 1 - Water Systems
8:00 Water Tank Maintenance & Repair
9:00 Meter Maintenance
10:00 Break

Morning Session 2 - Wastewater Systems
8:00 Roundtable Discussion on Aerobic Treatment Modes
10:00 Break

Morning - Joint Session
10:30 Man's Impact on a Freshwater Stream
11:45 Lunch

Afternoon - Joint Session
1:00 On-the-Job Safety Considerations: Program Development, Health Considerations, Electrical and Trenching Safety
3:00 School Officially Closes
3:30 SOS

Friday, September 18

8:00 Operator Certification Exam

Plant achieves "zero discharge" — by mistake

Virginia's Stafford County has what may be the first sewage treatment plant to comply with the letter of the law--the Clean Water Act, that is--which requires "zero discharge" by 1985. It seems that the county's new sewage plant, which cost $6 million and has every conceivable state-of-the-art gadget for cleaning the water, has no discharge pipe. The Associated Press quoted the design firm that engineered the plant saying, "It was a design oversight." According to F. Freeman Funk, engineer with the design firm, the pipe was left out when another pipe shown on blueprints was mistaken for it.

Changes proposed for the certification rules

CHANGES HAVE BEEN PROPOSED in the rules governing certification of water and wastewater operators. The principal changes would add an experience requirement for certification of operators and revise the classification of water and wastewater treatment plants.

It appears that Montana is the only state whose certification program does not have an experience requirement. The Board of Certification for Water and Wastewater Operators feels that experience as well as passing of a written examination are needed to provide the expertise necessary to run a system. Operators presently certified or certified by examination in September 1981 will not need to meet the experience requirements. The proposed experience requirements are shown below:

Experience/Education (1) to become fully certified an operator in addition to passing the certification examination for his specific classification shall have the following board-approved experience in a facility of that classification:

(a) First Class - 2 years experience
(b) Second Class - 1 1/2 years experience
(c) Third Class - 1 year experience
(d) Fourth Class - 6 months experience
(e) Fifth Class - No experience requirement.

(2) On the determination of the board that experience gained at a lower classified facility is applicable to a higher classified facility, this experience or a portion of it may be credited toward the experience requirement for the higher classification.

(3) For post-secondary education in engineering training or the equivalent, two days of education may be substituted for one-day experience up to 1/2 of the experience requirement.

(4) A person who has passed the examination but lacks the requisite experience will be issued a certificate as OPERATOR-IN-TRAINING. When the experience requirement is fulfilled as determined by the board, a certificate as OPERATOR will be issued.

The changes will align plant classifications more closely with specific types of treatment plants. The board will then be able to provide an examination more closely related to the type of plant to be operated. The proposed changes to the classification system are shown on the following table. Underlined words or phrases are additions to the rules. Crossed-out words are deletions to the rules. If your plant classification is changed due to the proposed change, it is proposed that you will be able to receive that particular certification classification automatically. If your present certification is higher now than the proposed

(Continued on Page 9)

	~~1~~I (First Class)	~~2~~II (Second Class)	~~3~~III (Third Class)	4IV (Fourth Class)	5V (Fifth Class
WATER PLANT OPERATORS ~~Surface*~~ ~~Ground~~ 1	~~Over 2,500~~ ~~Over 20,000~~ Treatment utilizing chemical coagulation, filtration and chlorination	~~500-2,500~~ ~~2,500-20,000~~ Treatment for surface water not utilizing chemical coagulation	~~100-500~~ ~~500-2,500~~ Well water supply serving over 2,500 people with or without chlorination	~~less than 100~~ ~~100-500~~ Well water supply serving 100 to 2,500 population with or without chlorination	~~----------~~ Well water supply serving less than 100 population with or without chlorination
WATER DISTRIBUTION * OPERATORS 1	Serving over 20,000 population	Serving 2,500-20,000 population	Serving 500-2,500 population	Serving 100-500 population	Serving less than 100 population
WASTE WATER ~~Primary*~~ PLANT OPERATORS ~~Secondary~~	~~Over 20,000~~ ~~Over 2,500~~ Conventional or high rate activated sludge and physical-chemical plants	~~2,500-20,000~~ ~~500-2,500~~ Treatment such as extended aeration, oxidation ditchs, trickling filters, bio-discs and primary plants discharging to surface waters.	~~500-2,500~~ ~~100-500~~ Aerated lagoons	~~100-500~~ ~~less than 100~~ Sewage lagoons not utilizing artificial aeration	~~less than 100~~ ~~----------~~
INDUSTRIAL WASTEWATER TREATMENT OPERATORS 2	Physical-chemical treatment facilities for precipitation and settling and/or biological treatment plants treating over 1.0 mgd.	Biological treatment plants serving under 1.0 mgd.	Treatment facilities primarily for oil removal.	Ponding facilities for removal of sediment and not utilizing chemical treatment.	
FEE (1 year)	$20	$15	$10	$5	$3

~~* According to population served (See definitions for surface, ground, primary, secondary)~~

1 When an accurate population census is not available, population served may be determined by number of service connections multipled by 3.0

2 Facilities discharging to municipal facilities and facilities for removing sediment without a surface water discharge do not need a certified operator.

classification, it is proposed that you will be able to retain that classification upon approval of the board.

The board plans a public hearing on the proposed revised rules in late October. They will be published in the Montana Administrative Register at least 30 days prior to the hearing. A news release also will be sent out to the newspaper services to announce the date of the hearing. If you wish to receive an official copy of the proposed revised rules, please write to the Board of Water & Wastewater Operators, Water Quality Bureau, State Dept. of Health & Environmental Sciences, Room A206, Cogswell Building, Helena, Montana 59620.

These rules should be available for circulation about Sept. 1. The board intends to consider all written comments and to make such comments part of the hearing record. ■

Goals and objectives:

They're important ingredients in good-quality drinking water

By Bob Butcher
Chief of Process Control
Billings Water & Wastewater Plants

UTILITIES MUST DEAL rationally with all parameters of water quality. Realistic goals must be defined and then stated in terms of objectives. Then a program must be implemented to achieve the goals.

The City of Billings public utilities felt that, in order to improve their overall process control and at the same time insure a more uniform quality of water, it was necessary to develop water-quality goals.

One of these goals was to produce a finished-water turbidity of less than or equal to .20 NTU's on a continuous basis. It was felt that if we could consistently produce .20 NTU finished water, we would also be able to improve our disinfection, reduce the amount of particulate matter that normally builds up in our reservoirs and distribution system and reduce the number of taste and odor complaints. It was also felt that this could be achieved with a very minimal increase in overall treatment cost, and that the benefits derived from the improved water quality would justify any additional cost.

Although the water treatment plant's effluent consistently meets state and EPA guidelines, there was never any true continuity in such water-quality parameters as turbidity. One day the effluent would be .25 NTU, the next day it would be .75 NTU. It was not that the plant operators had failed to properly treat the raw water, but instead the fluctuation was due to the fact that they had never been given any specific goals as to the quality of water they should produce other than it should meet state guidelines.

Once the particular goal had been defined, all individuals involved were made aware of its objectives and the means by which the goal was to be achieved.

To achieve this goal of .20 NTU's on a continuous basis, it was felt that some plant operations needed to be changed:

1 Filters were to be taken out of service when the filter effluent

turbidity exceeded .20 NTU. Prior to this, filter termination was based on loss of head and/or total hours of operation.

2 Filter backwash procedures were more clearly defined. This resulted in all of the operators using the same procedure instead of individual preference.

3 Filtration rates were not to be altered during filtration cycles. Any necessary rate changes were to be made as slowly as possible to avoid shocking the bed.

4 Each filter is provided with a continuous-monitoring turbidimeter to determine filter performance and to control the operation of the filter.

5 Operators were provided with continuous-monitoring turbidimeters, which enable them to monitor turbidity changes throughout the treatment system. This also enables them to observe the effects that chemical changes have on the system.

This approach to water quality and process control has enabled our water treatment facility to produce a better and more uniform quality of water. Although I have used turbidity as an example, this approach also can be used to control other parameters such as chlorine residual, hardness, pH, etc.

TO ENSURE FREEDOM from disease organisms and taste and odor problems, it is highly desirable to produce a water that has a turbidity of less than .1 NTU's. Although this is not a realistic goal for many water treatment plants at the present time, I feel that most water treatment plants can improve their water quality. In order to achieve this, each plant must first determine and define water-quality goals they feel are realistic and achievable. Just meeting state and EPA guidelines does not necessarily mean a water treatment facility is providing the best water possible or that its process control is satisfactory. Secondly, they must initiate a program that will attain the desired goals.

Defining goals takes some of the guesswork out of treatment-plant operations

By utilizing this approach, the City of Billings hopes to produce a finished water with a turbidity of less than .1 NTU.

This approach to water quality

BILLINGS WATER-TREATMENT PLANT EFFLUENT TURBIDITIES

	1975	1976	1977	1978	1980	1981
Yearly average	.45	.39	.51	.43	.18	.17
Max. monthly average	.95	.56	.72	.64	.28	.26
Min. monthly average	.18	.28	.35	.32	.14	.16

and process control has several other attributes:

- It gives the individuals involved a feeling of accomplishment when goals are met.
- It provides an objective that operators can strive for on a day-to-day basis.
- It provides a basis for cooperation between all treatment personnel since everyone is involved in trying to achieve these goals. Our treatment plant operators have reacted in a very positive way. Only through their effort and interest were we able to improve our water quality. ■

There's something sickening about the water

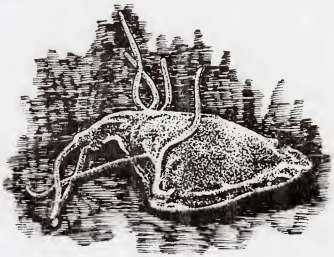
Giardia showing up more often in state's "pristine" streams

By Dayton Alsaker
Water Quality Bureau's
Billings Branch

GIARDIASIS IS AN ILLNESS caused by the protozoan, Giardia, which has been found in drinking water supplies. This microbe seems to be showing up more frequently, particularly in mountain streams, which are water sources that have historically been relied on for providing non-contaminated water. In recent years, giardiasis outbreaks have been caused by Giardia in municipal water supplies, even in Montana, most notably in Red Lodge this past year when more than 250 people got sick from drinking tap water. In fact, Giardia is now the most common pathogenic intestinal parasite and giardiasis is the most common waterborne disease caused by a parasite in the United States, according to the Center for Disease Control.

The Giardia organism exists in two forms, the pathogenic trophozoite (living form) and an encapsulated cyst (dormant form). The cyst can survive for several weeks in cold water, and it is this form which is transferred into a host organism. The trophozoite does not survive outside of the host. In the intestinal tract, the trophozoite emerges from the cyst and attaches to the intestinal wall.

Symptoms will normally show up 10 to 15 days after the infection. The symptoms of giardiasis vary somewhat, but generally include diarrhea, abdominal cramps, gas, nausea, vomiting and fatigue. Not all people exhibit symptoms. Diagnosis is normally made by stool examinations; however, these do not always confirm the cause of the illness, so treatment is often commenced without confirmation. Three drugs are used to treat giardiasis: Atabrine, Flagyle and Fluroxone. Cure rates are quite high.



A Giardia trophozoite

How Giardia is transmitted in the environment is not totally known;

however, it probably enters a stream through fecal contamination by a carrier. Many animals have been suspected or proven to be Giardia carriers. Beavers have been implicated in several waterborne outbreaks and appear to be the prime carriers.

Sampling water for Giardia is difficult. Special equipment and large volumes of water are required, and even then recovery rates are low.

PRECAUTIONS SHOULD be taken to prevent giardiasis. All surface waters, despite how clear they appear, should be considered contaminated. Boiling of water for a few minutes will kill cysts. Potential Giardia sources should be controlled in a watershed which is a municipal water supply source, if at all possible.

A treatment system to remove Giardia cysts from water needs to involve a properly operated coagulation, flocculation and filtration plant. Filtration seems to be the key to the removal process. Giardia cysts are 7-12 micrometers in size and therefore much larger than bacteria, so filtration works more effectively on them than bacteria. Disinfection by chlorine alone is not effective enough to produce a satisfactory kill of the cysts.

An article in the next edition of the Big Sky Clearwater will take a more detailed look at treatment of water to remove Giardia cysts.

References for this article were Martin S. Wolfe in Ped. Clin. of North Am. and Ernest A. Meyer and Edward L. Jaroll in Am. J. of Epidemiology. A complete list of Giardia references is available on request from the Dept. of Health and Environmental Sciences, Box 20296, Billings, Montana 59104.

Giardia "threatening" Missoula water supply

Giardia is present in the Rattlesnake drainage near Missoula and there is a "potential threat" that the creek, which supplies about 45 percent of Missoula's water, could become contaminated, according to a Lolo National Forest Report.

The report said Forest Service personnel tested stool samples from animals in the area and found eight confirmed Giardia cases out of 322 samples. No Giardia was found in the three beaver colonies that inhabit the Rattlesnake, making officials confident there's no Giardia in that stream yet.

The possibility of contamination of the creek worries the Mountain Water Company because the company has no filtration system for Giardia. The company's chlorine and ammonia treatment won't kill it. So the company might have to drill wells to help supply Missoula-- and that would cost money and raise rates.

The Forest Service is considering special restrictions on dogs in the Rattlesnake and will monitor the beavers annually.

Pesticides back-siphoned into three farmers' wells

Water hoses hooked to residential or livestock water supplies should not be left dangling in tanks containing pesticides.

Already this summer, wells on three Montana farms have been contaminated when pesticides have been "back-siphoned" into them. In each case, a hose -- being used to fill a pesticide tank with water--was left in the tank while it was still hooked up to the water system. For some reason, perhaps when water was turned on elsewhere around the house or farm, a vacuum effect occurred inside the hose, pulling pesticide-laden water into the system.

Many rural water systems are not equipped with devices that protect against back-siphoning, and some houses are equipped with "freezeless" outdoor faucets that actually induce it.

Questions for operators

The Montana Department of Natural Resources and Conservation mailed a short questionnaire to public water supply system operators throughout the state this summer. This survey is collecting information on domestic and commercial water use which will supplement available information on water quality and water availability.

The data gathered will be stored, along with other water use information, in the Montana Water Use Data System (MWUDS). The MWUDS program, now in its early stages, is designed to measure water use in a broad range of categories based on the informational needs of groups in water resource planning, management, and operation. In time, MWUDS will provide detailed Montana water use data that will be readily available to water resource managers. For further information contact Gary Knudson, 449-2882.

A sabbatical in Hawaii

Martha Anne Dow, president-elect of the Montana Water Pollution Control Association and head of the water and waste-water technology program at Northern Montana College, was scheduled to leave in August for a year's sabbatical in Hawaii. She has received a grant to do research in "freshwater and marine virology in polluted water" through the University of Hawaii.

Dow also has received tentative approval of her request for 104(g) funds from the Environmental Protection Agency to be used in purchasing technical library materials. These materials will be made available, on a loan basis, to Montana operators.

ACTIVITY	NORMAL USE	CONSERVATIVE USE
 Shower	Water running *25 gallons*	Wet down, soap up with water off, rinse off *4 gallons.* Use free Water Restrictor.
 Tub bathing	Full tub *36 gallons*	Minimal water level *10 to 12 gallons*
 Brushing teeth	Tap running *10 gallons*	Wet brush, rinse *one half gallon*
 Shaving	Tap running *20 gallons*	Fill basin *1 gallon*
 Dishwashing	Tap running *30 gallons*	Use pan or sink *5 gallons*
 Automatic dishwasher	Full cycle *16 gallons*	Short cycle *7 gallons*
 Washing hands	Tap running *2 gallons*	Fill basin *1 gallon*
 Toilet flushing	*5 to 7 gallons*	Use of tank displacement bottle *4 to 6 gallons*
 Washing machine	Full cycle, top water level *60 gallons*	Short cycle, low water level *27 gallons*
 Outdoor hose use	*10 gallons per minute*	Lowest priority—eliminate

Saving water also saves the considerable energy needed to pump it, treat it, and remove it. Heating water is second to space heating/cooling in home energy use and expense.

Figures provided by American Waterworks Association

Chlorine explosion at Victoria

In mid-August last year, there was an explosion at the Victoria, B.C. City Works Yards. The explosion resulted when a container, formerly used for glycerol antifreeze, was used to scoop up calcium hypochlorite.

Any operator who attended any of the Water and Waste Schools will recall an experiment with calcium hypochlorite mixed with toothpaste which also resulted in an explosion.

At Victoria, 20 seconds after the calcium hypochlorite was put into the old antifreeze container, a dense cloud of thick white smoke appeared, lasted 5 to 10 seconds, then burst into flame. The inspector who reported the incident stated that "the flame was a dark, deep red colour and burnt in a volcano-like way throwing burning particles in all directions, and producing a flame approximately 3-4 feet in height. The heat of this fire was felt by persons standing approximately 30 feet away."

One of the operators involved received first degree burns to his hands, the other received first degree burns to his hands and face.

Reprint from: B.C. Operator's Digest.

Be careful when handling calcium hypochlorite.

"I hope you people up here realize you're polluting the river down at the village with boiling oil, broken arrows and chunks of hardened molten lead."

Operators' Certification Corner

SAMPLE TEST QUESTIONS

1. The cross-sectional area of an 8" pipe is _____ times the cross-sectional area of a 4" pipe.

2. If a meter records 25 cubic feet of water passing through in 30 seconds, what is the flow rate in GPM?

3. 20 feet of water in a tank will cause a pressure of _____ PSI at the bottom of the tank.

4. Coagulation is the proces of:

   a. Removing large suspended materials from water
   b. Removing floating materials from water
   c. Forming large particles from small ones
   d. Breaking down large particles into smaller ones

5. 15 pounds of chlorine are added to a tank measuring 40 feet in length by 25 feet in width with a water depth of 6 feet. What is the chlorine concentration in P.P.M.?

6. If 5000 gallons of sludge containing 1.5% solids is thickened to 5% solids, the new volume will be _____ gallons.

USEFUL FORMULAS

$V_1C_1 = V_2C_2$, $\pi = 3.14$, Pounds = PPM x 8.34 x MG,
1 ft. of water = 0.43 PSI, 1 cubic ft. = 7.48 gallons,
area of a circle = πR^2

Answers

1. 4 2. 374 3. 8.6 4. C 5. 40 6. 1500

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